

em $r=R$: $-k_f \frac{dT}{dr} = \frac{R q'''}{2}$

$$T = -\frac{R^2 q'''}{4k_f} + C_2$$

$$\frac{R q'''}{2} = h \left(-\frac{R^2 q'''}{4k_f} + C_2 - T_m \right)$$

$$C_2 = T_m + \frac{R q'''}{2h} + \frac{R^2 q'''}{4k_f}$$

$$T = -\frac{q'''}{4k_f} r^2 + \frac{R^2 q'''}{4k_f} + \frac{R q'''}{2h} + T_m$$

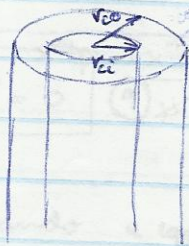
mas: $q' = \pi R^2 q'''$

então: $T = -\frac{q'}{4\pi k_f} \frac{r^2}{R^2} + \frac{q'}{4\pi k_f} + \frac{q'}{2\pi h R} + T_m$

$$T(r) = \frac{q'}{4\pi k_f} \left(1 - \left(\frac{r}{R} \right)^2 \right) + \frac{q'}{2\pi h R} + T_m$$

$T_{\max}$ quando $r \rightarrow 0$

CASO ⑤



$$0 = \frac{k_c}{r} \frac{d}{dr} \left(r \frac{dT}{dr} \right)$$

em $r=r_{ci}$: $-2\pi r_{ci} \cdot k_c \frac{dT}{dr} = q'$

$$-k_c \frac{dT}{dr} = h(T - T_m)$$

em $r=r_{co}$: $\frac{d}{dr} \left(r \frac{dT}{dr} \right) = 0$

$$r \frac{dT}{dr} = \text{cte} = -\frac{q'}{2\pi k_c}$$

$$\frac{dT}{dr} = -\frac{q'}{2\pi r k_c}$$

$$T(r) = -\frac{q'}{2\pi k_c} \ln r + C_2$$

$$-k_c \frac{dT}{dr} = \frac{q'}{2\pi r_{co}}$$

assim: $\frac{q'}{2\pi r_{co}} = h \left(-\frac{q'}{2\pi k_c} \ln r_{co} + C_2 - T_m \right)$

isolando C_2 e substituindo: